



## **REALSYSTEM SERVER BEST PRACTICES**

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## REALSYSTEM SERVER BEST PRACTICES

### Audience

This white paper provides the “best practices”—or the most useful techniques and approaches—for deploying RealNetworks® RealSystem Server® across a network. It is targeted at network managers, system architects, and administrators who are interested in using RealServer for the following purposes:

- Building a streaming media network infrastructure.
- Delivering streamed content rapidly and efficiently, regardless of the data transmission rates, or bandwidths, of the connections.

This white paper assumes a solid understanding of RealServer, network architecture, and the leading operating systems, as well as familiarity with the process of creating streaming media files. For a more thorough understanding of these technologies, see the links in the Additional Resources section later in this paper.

Because of the bandwidth-hungry nature of streaming media, the consistent and reliable delivery of streamed files—often over complex network paths—is imperative. Understanding how to calculate your hardware and software system requirements is crucial to building an effective, scalable network that can respond gracefully to sudden bursts of traffic. While RealNetworks provides reasonable numbers for basic planning on the three most popular platforms, in the Memory Usage section, there are numerous variables that can affect your real-world deployment and performance.

## Performance Tuning

### System-Specific Tips

Even though RealSystem Server is available for a wide range of platforms, the tuning tips presented in this section focus on the three that are most widely used:

- Linux RedHat version 6.2
- Windows NT version 4.0
- Solaris versions 2.6 and 2.7

#### Linux Redhat 6.2-Specific Tuning Tips

Be sure to download and apply the latest patches, which are available at <http://www.redhat.com/support/docs/rhl62.html>. For other UNIX kernels (such as Debian, for example), refer to your system documentation.

We recommend that you upgrade to the latest stable Linux 2.2.x kernel, which is available at <http://www.kernel.org>. By using the latest version of this kernel with the glibc2 library, you will experience improved performance in the following areas:

- The Linux 2.2.x kernel now has improved symmetric multiprocessing (SMP) capability, which is the technology that enables it to use multiple processors.
- The glibc2 library makes extensive use of multiple threads, which work very well with RealServer's multithreaded model.

We do not recommend using any Linux 2.3 or 2.4 kernels, as RealServer has not been thoroughly tested with these newer kernels.

After you have upgraded the Linux 2.2.x kernel, use the following instructions to make specific file descriptor changes for RealServer 8.

#### Editing Linux 2.2.x Kernel File Descriptors

Append the following lines of code to `/etc/rc.d/rc.local`:

```
echo "32768" > /proc/sys/fs/inode-max
echo "19000" > /proc/sys/fs/file-max
echo "1" > /proc/sys/net/ipv4/tcp_syncookies
echo "2" > /proc/sys/net/ipv4/tcp_retries1
echo "8192" > /proc/sys/net/ipv4/tcp_max_syn_backlog
```

Note that there is no need to set the `streamersessioncapacity` variable.

#### Shell Limit

Log on as root, and then set `'ulimit -n 32768'` in the shell that starts RealServer.

By default, RealServer reserves 256 MB of memory (RAM) on your computer.

### Windows NT-Specific Tuning Tips

Be sure to download and apply the latest patches, which are available at <http://www.microsoft.com/ntserver/>.

### Solaris 2.6- and 2.7-Specific Tuning Tips

Be sure to download and apply the latest patches, which are available at <http://sunsolve.sun.com/>.

On Solaris 2.6 and 2.7 systems, RealServer is designed to “prereserve” a large amount of memory and then use memory from that block. If you are running *only* RealServer on your computer, you can increase the amount of available memory by using the `-m` command, which you can set on RealServer’s startup screen. Do not reserve more than 75 percent of your computer’s total memory for RealServer, or its performance will suffer.

#### Editing Solaris Kernel File Descriptors

On Solaris 2.6, the number of file descriptors for the select function call is hard-coded at 1024 and cannot be changed. To get around this, the RealServer core will automatically generate another streamer process that has 800 file descriptors.

#### Shell Limit

On Solaris 2.7, log on as root, and then set `'ulimit -n 32768'` in the shell that starts RealServer.

### Running RealServer Alone

Regardless of the platform being used, RealServer performs best when it runs on a dedicated computer—that is, one that has nothing else installed on it. Therefore, avoid installing Web servers or other applications on the same computer as RealServer.

The following table lists the network interface cards (NICs) that have been identified as working well with RealNetworks RealSystem<sup>®</sup>.

**Recommended Network Interface Cards**

Platform	Card Product Name
Linux	Intel EtherExpress Pro
Windows NT or 2000	Intel EtherExpress Pro
Solaris	Sun built-in

## Memory Usage

RealServer uses a multithreaded, CPU-sharing model. Threads share their environment and metadata information with each other, so statefulness does not need to be tracked as threads change. Multithreading is particularly well-suited to client/server architecture. When a client tries connecting to the server, the system manager creates a new thread to manage that client, while another thread listens for additional client connections.

In working with streaming media, a general rule of thumb is to provide 12 KB of random-access memory (RAM) for every kilobit per second (Kbps) of streaming. RealServer performs best when it is running on a system with more than one processor, or CPU. This is because within a multiprocessor system, the scheduler can carry out the same process over multiple processors by simultaneously running a different thread on each one.

Running RealServer on a multiprocessor system is also a wise choice if you decide to use the Ad Serving extension to RealServer, or if you are generating numerous SMIL media files (SMIL stands for Synchronized Multimedia Integration Language).

Adding more memory to a computer will, of course, enhance its performance. With streaming media especially, to accommodate peak surges in network traffic, install more memory than you think you would ever need. If there is not enough RAM available for all of the information the CPU needs, the computer has to create a virtual memory file, reserving space on the hard disk to simulate additional RAM. This process, known as “swapping,” slows the system down.

Memory and processors affect RealServer performance in somewhat different ways. Adding memory enables RealServer to handle more information at any given time, whereas adding processors enables RealServer to process



information faster. Thus, if you add processing power to a system, additional memory will help the processors perform at their optimal level.

The following table provides real-world memory-usage benchmarks for RealServer. It uses the metric of estimated bandwidth being served to calculate computer memory recommendations across the most-used platforms. Note that although these configurations are intended to reflect real-world usage, your results may vary.

**Recommended RealServer Computer Configurations**

Estimated Streams Served	Estimated bandwidth served	Linux	Windows NT 4.0	Solaris 2.6	Solaris 2.7
45	10 MB	Pentium II 350, 512 MB RAM	Pentium III 500, 512 MB RAM	Ultra 10, 512 MB RAM	Ultra 10, 512 MB RAM
134	30 MB	Pentium III 750, 768 MB RAM	Pentium III 750, 768 MB	Ultra 30, 768 MB RAM	Ultra 30, 768 MB RAM
267	60 MB	Dual Pentium III 750, 1024 MB RAM	Dual Pentium III 750, 1024 MB RAM	Ultra 60, 1024 MB RAM	Ultra 60, 1024 MB RAM
445	100 MB	Dual Pentium III 750, 1024 MB RAM	Quad Pentium III 750, 2048 MB RAM	E250, 2048 MB RAM	E250, 2048 MB RAM

## Tips and Tricks

This section provides a number of tips and techniques you can use to improve RealServer's performance with other system components.

### Layer-4 Load Balancing Switches

Layer-4 switches currently do not recognize the UDP conversation sent from the client, if there is a re-send request due to lost packets. This happens because UDP data coming from the server to the client is sent to the client's IP address, bypassing the Virtual IP (VIP). The client still believes the server's IP address is the VIP, so it returns its UDP traffic to the VIP. The Layer-4 switch (acting on the VIP port) does not recognize the UDP data, and drops the packet. Therefore, UDP data from the server to client works, but UDP traffic from the client to the server does not. This affects the quality-of-service for all clients accessing content through a switch.

RealServer now supports the RTSP transport parameter of the "source address" (as discussed in RFC 2326). This feature enables the source RealServer to specify to the client what IP address it should use in sending back its UDP data.

To enable this workaround, the RTSPSourceAddress configuration variable must be added to the server's configuration file:

```
<Var RTSPSourceAddress="*" />
```

If "\*" is specified, then the server will insert the IP Address of the network interface that the client address came in on.

Equally acceptable is designating a specific IP address:

```
<Var RTSPSourceAddress="170.137.192.0" />
```

Note that this edit will require that you restart your server.

### NFS, Caching, and Content Management

The Network File System (NFS) is a distributed file system that enables UNIX- or Solaris-based computers to access files and directories located on remote computers and to treat those files as if they were local. Often, deployments will include computers that are specifically designated to serve only streaming media.

If possible, avoid using NFS as either a client or a server. It adds overhead and latency to the network, resulting in poorer performance. If you choose to use NFS and its caching functionality to manage your files—especially with content that needs to be updated frequently—be careful not to hard mount your paths, as this will result in the files being overwritten, with no mechanism available for controlling which file versions are the ones intended for distribution.

### Reporting

Be sure to set parameters for access and error log files; otherwise, they will accumulate data indefinitely and consume system resources needlessly. Limit the log files either by time period or by size. You can set these restrictions in the Logging section in System Administrator, at **[http://yourserver:youradminport#/admin/config\\_logging.html](http://yourserver:youradminport#/admin/config_logging.html)**.

### Bandwidth Management

You can set restrictions on streaming media bandwidth consumption in the Connection Control section of RealSystem Administrator (at [http://yourserver:youradminport#/admin/config\\_allow.nc.html](http://yourserver:youradminport#/admin/config_allow.nc.html)), where you can:

- Control the number of RealPlayers that can receive streamed media from RealServer simultaneously.
- Limit the amount of bandwidth used by RealServer.

You can also distribute the stream capacity established in a valid license file to other RealServers (*subscriber* RealServers) that you operate. To do this, see the License Group section in RealSystem Administrator, at [http://yourserver:youradminport#/admin/config\\_license.html](http://yourserver:youradminport#/admin/config_license.html).

### DNS Round-Robin

Round-robin is a clustering technique that makes load sharing possible among multiple RealServers. All of the main RealServer platforms—Linux, Windows NT, and Solaris—support DNS and BIND. (DNS stands for Domain Name System, a hierarchical system that translates host names, or domain names, into Internet addresses.)

This technique enables you to duplicate address records for a specific RealServer host, with different IP addresses. The domain name server then rotates addresses for any name that has multiple address records, thus handing off the load to an available RealServer as client requests are received.

### RealPlayer

When installing RealPlayer® on a local area network (LAN) that has an ISDN router to the outside world, always be sure to disable RealPlayer's Auto-Update functionality within the StartCenter feature. Otherwise, this feature may trigger the dial-on-demand feature in the router, resulting in continual, unnecessary dial-ups that could cost money and consume precious bandwidth.

► To disable Auto-Update:

1. In RealPlayer, click **View>Preferences**.
2. On the General tab, click the **Settings** button under StartCenter.
3. Clear the **Enable StartCenter** check box.

4. When asked whether you are sure you want to disable StartCenter, click **Yes**, and then click **OK**.
5. Click **OK** in the Preferences dialog box.

## Determining the RealServer Version

There are two methods for finding out which version of RealServer you are running. The following procedures explain these methods.

- To determine the version programmatically:

At the command prompt, navigate to the Bin directory, and then type the following:

```
rmserver -v
```

The version number appears, using the following syntax: 8.x.x.xxx.

- To determine the version by using RealSystem Administrator:

In RealSystem Administrator, click **About** under **Help** in the table of contents area on the left.

A new browser window appears, with information about your RealServer. The version number can vary, depending on the operating system you are using.

## Diagnosing RealServer Load Problems

Use RealServer's error messages to pinpoint problem areas.

### High Capacity Mode

The "High Capacity mode" error message is a definite flag for performance problems, as it means that your computer is currently using more than 75 percent of your system's capacity.

The RealServer error log is the first place you should go to review sluggish RealServer performance, especially if you are testing file performance. The error log's default location in Windows NT is as follows:

```
C:\Program Files\Real\RealServer\Logs\rmerror.log
```

For UNIX-based systems, there is no automatic default path, and the log file name is ...../rmerror.log.

The following is a sample error message:

\*\*\*20-Oct-00 18:21:30.539 logplin(1571): The server has entered High Capacity mode, this may result in lowered quality of service for some players. The current load is xxx Mbps total output to xxx players (0% PNA, 100% RTSP, 0% HTTP, 0% TCP/Cloaked, 100% UDP, 0% MCast).

### RealServer Error Messages

For a comprehensive list of all of the error messages you might encounter when using RealServer, plus instructions for resolving them, see the following publication:

**<http://service.real.com/help/library/guides/g270/srvmsgs/srvmsgs.htm>**

### Other Troubleshooting Tips

*The RealServer Administration Guide* offers a wide range of troubleshooting tips in Chapter 21. You will find this guide at

**<http://service.real.com/help/library/guides/server8/realsrvr.htm>**.

Whenever RealServer-specific security concerns arise, RealNetworks moves quickly to address them. The most recent security alerts are posted at

**<http://service.real.com/help/faq/security/index.html>**.

## New Features in RealSystem Server

This section discusses several of the key new features in RealSystem Server.

### Distributed Licensing

This feature allows a set of RealServers within an organization to use the same license file. Features can be configured individually on separate RealServers, while sharing a pool of connections. The master license publisher will allocate its stream capacity equally among the license subscribers. Only one license publisher is active at any given time; additional license publisher hosts can be set up to provide redundancy in the event of a power outage or other network disruption.

To determine the stream capacity of a given RealServer, click **About: Summary** in the table of contents area in RealSystem Administrator, and then view the numbers to the right of **Max Client Connections**.

### Improved Codecs

When used with RealProducer<sup>®</sup>, RealVideo<sup>®</sup> provides VHS quality for cable and DSL modems (500 Kbps) and near-DVD quality (1 Mbps).

### Port Hinting

For those clients that can receive RealServer content only by way of the method known as “HTTP cloaking,” you can now create URLs that list the ports to try so that the client does not waste time by trying to discern the correct port.

### Redundant Encoders

You can now use multiple sources as input for RealServer. With multiple sources, should one stream become unavailable, RealServer will automatically switch all users to the next available stream, thus ensuring a high quality of service for the users.

### Splitting

The splitting feature has been completely rewritten to provide greater reliability, with some changes in terminology. What used to be called a *source server* is now called a *transmitter*, and what was called a *splitter* is now called a *receiver*. Also, note that multicasting between sources and splitters is now possible. As with RealServer 7, though, you can use splitting to deliver only live broadcasts; currently it does not work for on-demand broadcasts.

The RealSystem Server Readme file provides extensive information about the changes in splitting functionality from version 7 to version 8. This file is available at

**<http://service.real.com/help/library/guides/server8/readme.html>.**

### RealServer 7 License Key

RealServer 7 license keys do not work on RealSystem Server 8. For more information on upgrading to RealSystem Server 8, visit the RealNetworks Customer Service Web site at **<http://service.real.com/faq/contcs.html>**, or call 1 (206) 674-2651. When RealNetworks releases a new major product version, we send out a new license to you via email. However, you must own a valid Upgrade and Support Contract at the time of the software release for you to receive the upgrade license file. If you have a valid Upgrade and Support agreement and did not receive the email, please contact Customer Service and we will send you the new license.

## Additional Resources

This section lists the documentation and other support options available for RealServer and associated RealNetworks products.

### Documentation

#### RealServer Administration Guide

This guide explains how to run the standard RealServer on whatever operating system (platform) you are using. You will find this book at

**<http://service.real.com/help/library/guides/server8/realshr.htm>.**

#### RealServer Readme File

The Readme file flags late-breaking changes and other news related to RealServer. It also outlines general setup recommendations. You can view the latest version of this file at

**<http://service.real.com/help/library/guides/server8/readme.html>.**

#### Developing for RealServer's Web-based Management Application, the RealSystem Administrator

This white paper explains how to customize RealSystem Administrator for your own or third-party plug-ins. You will find this paper at

**<http://service.real.com/help/library/whitepapers/wpaper.html>.**

#### Firewall Support

Setting up RealServer to stream files past firewalls is a commonly performed task. Documentation on how to do this is presented at

**<http://service.real.com/firewall/>.**

#### RealSystem Production Guide

This guide covers the nuts and bolts of creating streaming media and discusses authoring techniques you can use for optimum file performance. To view this book, go to

**<http://service.real.com/help/library/guides/production8/realpgd.htm>.**

### RealProducer Plus User's Guide

This guide shows you how to use RealProducer to yield the highest possible quality of encoded content. You will find this book at

**<http://service.real.com/help/library/encoders.html>.**

### Working with RealProducer 8 Codecs

This document provides a detailed review of the significantly upgraded codecs that come with RealProducer 8. For a run-down of the best techniques for working with these codecs, see this blueprint at

**<http://service.real.com/help/library/blueprints/8codecs/producer8codecs.html>.**

### RealProxy Administration Guide

This guide fully documents RealProxy<sup>®</sup>. It explains how, in large-scale network deployments, RealServer works in tandem with RealProxy to reduce network traffic by eliminating redundant requests. You will find this book at

**<http://service.real.com/help/library/guides/proxy/proxy.htm>.**

## Support Options

Sometimes, despite your team's best efforts, you will encounter a problem that you can not solve. RealNetworks offers two options for finding solutions to such problems: a comprehensive support program, and basic support.

### Platinum Support

The Platinum Service Program for RealServer assigns a Technical Account Manager (TAM) to you. This person works closely with you to help solve your problems and address your issues. You can learn more about this program at

**<http://www.realnetworks.com/products/servers/platinum.html>.**

### Regular Support

You can call or e-mail our Technical Support team at any time. For the specifics, see **<http://service.real.com/help/call.html>.**

### RealForum

Real Forum is a Web venue that hosts a moderated e-mail discussion group focused on using RealNetworks products. There you can post messages about the best methods you have found for creating content using RealNetworks



technologies or for planning and implementing streaming media. You can sign up at <http://proforma.real.com/rn/misc/realforum/index.html>.

## Appendix: Encoder-to-RealServer Parameters

A crucial component of any broadcast network is the encoder. Your encoding platform captures, compresses, and formats your streaming media files. The encoded content can be sent directly to RealServer for streaming, or it can be saved for later broadcast. You can download RealProducer, RealNetworks' streaming media authoring tool, from

<http://www.realnetworks.com/products/producerplus/info.html>.

The following tables provide a comprehensive overview of audio and video benchmarks for encoder-to-RealServer capacity parameters. (Note that RealNetworks SureStream™ technology is used in all of the scenarios presented in these tables.) These benchmarks illustrate the other end of the streaming equation—the *beginning* of the process of encoding your files and streaming them to RealServer. This information is especially useful if your encoder resides at a different, remote location and you need to establish a communication link back to the RealServer.

These benchmarks are based on RealServer 7.02 numbers, but you can extrapolate them to apply also to RealProducer versions 8 and 8.5, as nothing has changed technically in the way media is streamed between encoders and RealServer.

**5:00 + Video: Normal Motion Using Standard SureStream—Voice Only**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
X						37.00	52.00	141
	X					69.90	100.00	143
		X				88.80	127.00	143
			X			162.90	229.00	141
				X		384.30	466.00	121
					X	261.80	347.00	133
X	X					66.00	87.00	132
X	X	X				111.00	141.00	127

(Table Page 1 of 2)

**5:00 + Video: Normal Motion Using Standard SureStream—Voice Only (continued)**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
X	X	X	X			182.50	226.00	124
X	X	X	X	X		535.50	619.00	116
X	X	X	X	X	X	520.50	608.00	117

(Table Page 2 of 2)

**5:00 + Video: Normal Motion Using Standard SureStream—Voice with Background Music**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
X						34.00	47.00	138
	X					66.90	96.00	143
		X				88.80	126.00	142
			X			162.90	229.00	141
				X		384.30	465.00	121
					X	261.80	344.00	131
X	X					61.50	80.00	130
X	X	X				106.50	135.00	127
X	X	X	X			178.00	219.00	123
X	X	X	X	X		531.00	611.00	115
X	X	X	X	X	X	516.00	604.00	117

**3:00 + Audio: White Noise Using Standard SureStream—Voice Only**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
X						31.00	40.00	9.00
	X					31.00	40.00	9.00

(Table Page 1 of 2)

**3:00 + Audio: White Noise Using Standard SureStream—Voice Only (continued)**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
		X				56.50	69.00	12.50
			X			112.10	129.00	16.90
				X		112.10	127.00	14.90
					X	112.10	128.00	15.90
X	X					31.00	40.00	9.00
X	X	X				63.00	77.00	14.00
X	X	X	X			127.10	149.00	21.90
X	X	X	X	X		127.10	149.00	21.90
X	X	X	X	X	X	127.10	149.00	21.90

(Table Page 2 of 2)

**3:00 + Audio: White Noise Using Standard SureStream—Voice with Background Music**

Codec Used						Encoder reported rate (Kbps)	Average measured bandwidth (Kbps)	Measured/ encoder (percent)
28.8 KB	56 KB	Single ISDN	Dual ISDN	DSL	LAN			
X						31.00	40.00	129
	X					56.50	68.00	120
		X				56.50	69.00	122
			X			112.10	129.00	115
				X		112.10	128.00	114
					X	112.10	127.00	113
X	X					63.00	77.00	122
X	X	X				63.00	77.00	122
X	X	X	X			127.10	149.00	117
X	X	X	X	X		127.10	149.00	117
X	X	X	X	X	X	127.10	149.00	117